

PRINCIPLES AND OBSERVATIONS

APPLIED TO THE

MANUFACTURE AND INSPECTION

POT AND PEARL ASHES.

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MASSACHUSETTS.

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*THE following observations relate to an extensive business;
and are designed, in the plainest manner, to convey profitable in-
formation to those interested in it, who have not leisure or oppor-
tunity to search for the principles therein contained, in the writ-
ings of professional Chemists.*

PRINCIPLES AND OBSERVATIONS.

POT and Pearl Ashes have for a long time been amongst the most valuable articles of manufacture and commerce in this part of our country.

To preserve and improve so great a branch of business is an object interesting and important to this Commonwealth, and, as such, has employed the attention of the Legislature. "An Act to ascertain the quality of Pot and Pearl Ashes, and for the more effectual Inspection of the same," is intended to effect this salutary purpose; and the operation of it ought to remedy evils which have deprived our citizens of the commercial advantage of their own manufacture, and our manufacturers of the highest market price for their Ashes, unless they transported them to the State of New-York for inspection. For, under our old law, the inspection was superficial. The consequence was, that the most indifferent Ashes came to our market; even the refuse from New-York was often brought to Massachusetts for exportation; while it became an object to many, who sought a market for Ashes of the first quality, to send them

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from Massachusetts, by an expensive transportation, that their real value might be stamped upon them by the superiour credit of the New-York brand. A difference of price current obtained between New-York and Massachusetts Ashes, both in Europe and America ; and Ashes exported under the advantage of the New-York brand, would sell from three to four pounds per ton higher than that from Massachusetts.

To put a stop to this ruinous traffic, the Legislature thought proper to frame the new law, adopting a mode of inspection similar to that practised in the State of New-York, that we might participate of the benefits naturally resulting to us from this important export.

Much therefore depends on the execution of this law, and it may be of use to enquire into the principles on which the inspection and examination are conducted, that they may be fairly and generally understood.

The excellence of Pot and Pearl Ashes is in proportion to the quantity and purity of the alkaline salt they contain ; and, it appears, that in this proportion they are estimated by those who consume them.

The very best kind is sought after by chemists and druggists,—for the bleaching of fine threads, linens and cottons—and for the manufacture of the finest glass.

The dyers and calico printers require such as will not impart colour, or leave the least stain or tinge in their work.

PEARL

PEARL ASH, *First* SORT.

THIS is the alkaline salt in a *mild* state, and in a high degree of purity. It is a perfectly white substance, uniform in its texture and appearance throughout, dissolves easily in water, gives a clear and colourless fluid without sediment, except a very small portion of white earth, such as is deposited on every solution of the purest alkaline salt that can be obtained; and containing so little of neutral salts as neither to be injured by them in its use, nor depreciated in its value by their weight. Such as this is supplied in great quantities from many of our manufactories, and commands the highest price.

PEARL ASH, *Second* SORT.

SOME Pearl Ash falls short of this high degree of purity, not being properly calcined, or, as the term is, *pearled* throughout. If pearled in kettles, the finer part is an heavy meal-like substance; the lumps, hard and flinty; the whole of a yellow or greenish cast. If pearled in the oven, and not properly manufactured, it is generally very blue, not easily dissolved, and unlike that large light porous lump so much preferred in the London market. Another kind, is of a dull dead white, inclining to grey, occasioned by not settling the lye, or by dipping it so as to disturb the sediment, of which a very little will
diffuse

diffuse throughout, and materially depreciate a very large quantity of Pearl Ash. All these however are valuable, being rich in the genuine salt, and are used in a variety of bleaching, and for many purposes which make them in demand; but not at the first price; therefore, they are denominated the second sort.

P E A R L A S H, *Third Sort.*

WHEN the appearance of Pearl Ash is totally different from the above description, is of various colours, hard of solution, and the solution charged with colouring matter, depositing a dirty, dark sediment, it is unfit for the nicer purposes in the arts, and therefore, suffers such a reduction of price, as operates to the exceeding loss and injury of the manufacturer, if imprudently he offers it at market. Whenever Pearl Ash, under the best appearance, is found to contain a great portion of neutral salts, it is undervalued accordingly.

P O T A S H.

THERE are many articles bleached, of so firm a fabric, as not to be sufficiently acted upon by the alkaline salt, in a mild state. To be thoroughly whitened, they require a greater degree of *causticity*.

The manufacture of soap also creates an immense demand for the *caustic* alkali, a quality in the alkali necessary to dissolve the oil or fat in the composition of soap, and render it miscible with water.

Our

Our *Pot Ash* is this caustic alkali. The appearance of it, very different from Pearl, soon changes from the action of the air upon its surface ; therefore, to form the first opinion of it by the eye, it is necessary to break the lumps.

P O T A S H, *First* SORT.

THE best is generally of a light stone grey, or marbled white and grey, with a crystalline core ; caustic or burning to the touch, and, although in appearance like a stone, and almost as hard, it so greedily attracts moisture from the air, that when exposed to it but for a short time the surface of this stone-like substance completely dissolves. This, which is denominated first sort of Pot Ash, is however very far from being a pure salt ; as any one may easily observe, by letting a solution of it rest, until it deposits a sediment. Yet, it is the best that is generally sent to the market, and until there is a further improvement of this manufacture, must be considered as the standard.

P O T A S H, *Second* SORT.

BESIDE the foregoing, there are large quantities of Pot Ash, of different degrees of purity, of various colours, that, on examination, merely by the eye, shew marks of heterogeneous mixture, arising from want of sufficient attention to what is called by the manufacturer, settling the lyes ;
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whereby the finer earthy parts of the wood-ashes get enveloped with the salt : or, for want of proper management of the fire, not continuing it long enough, or not raising it sufficiently to destroy what the workmen call the sulphur. This sulphur which is the inflammable or black colouring matter, is most injurious to the purity of the alkaline salt, and cannot be separated from it in large manufactories, but by fire, as is hereafter explained.

This impurity, in its different degrees, is seen at once, by the different shades of red it gives the Pot Ash. In the brightest pink coloured, where it is clear, without an edging of coal black, or mixed or marbled with light grey, the black colouring matter is in so small degree that it is placed with the first sort. If it is of a deeper red, it shews a greater quantity of this colouring matter, and by wetting a piece of it, and rubbing it a little, there may be discovered a very considerable degree of foulness, that is not in the Pot Ash before described, and is therefore denominated the second sort.

P O T A S H, *Third Sort.*

WHEN Pot Ash is of so deep or dark liver coloured red as to turn black on exposing it but a short time to the air; or when wet and rubbed, it appears foul and black as the blackest ink, interspersed throughout its whole substance with small
black

black specks, as if sprinkled with dust of charcoal, or imperfectly melted ; it is then almost as impure as what are called black, or Pot Ash salts.

If, as was observed of Pearl Ash, with the best appearance, Pot Ash contains neutral or foreign salts in quantity, it is depreciated accordingly.

The foregoing observations contain a very general description of the Pot and Pearl Ashes brought to the seaports of this Commonwealth, for exportation, together with an account of some of the uses to which they are applied. Further remarks may be of use to some manufacturers of Ashes, and may perhaps enable them to conduct their business with more ease, satisfaction, and certainty of success, than they have hitherto been used to ; whereby they may prevent such great loss as is sustained in transporting so heavy an article by land carriage, some hundreds of miles, as they sometimes do, in a *depreciated state*, when it has not been properly manufactured.

That there may be an understanding of the principles that should direct in this manufacture, previous to an account of the processes by which Pot and Pearl Ashes are made, it will be necessary to premise, that, although all alkaline salts obtained from vegetables when absolutely pure, are precisely the same ; yet, there is a difference between Pot and Pearl Ashes, though made from the same lye, which admirably adapts them for different uses. This difference exists in nothing

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but the comparative mildness of the one, and the causticity of the other : therefore, the terms *mild* and *caustic* have been used, to express the different properties of the same alkaline salt under different forms. The mild quality depends on a principle, next to fire and water, the most active agent in this business. It has been very little attended to by manufacturers, although long known amongst chemists by the name of gaz, fixable or fixed air, and now generally denominated the aerial acid. This is absorbed from the common air, often from spring water ; and Pearl Ash in its utmost state of purity and perfection, is now known by the name of the aerated alkali.

The caustic quality of Pot Ash depends on the absence of this aerial acid, and suggests the propriety of the different modes that are practised to obtain the same alkaline salt, well prepared, for different purposes. From the beginning, through every stage of the manufacture of Pearl Ash, this aerial principle applies itself, and its operation will be particularly attended to, when we come to the pearling process.

The common hard wood throughout this country furnishes alkaline salt in great abundance : what is called soft wood, such as every species of pine, is well known to yield but little.* From the

* S. Blodget, Esq; now living in Haverhill, formerly a scientific manufacturer of Ashes in this town, has bestowed indefatigable attention on experiments, that shew the different quantities of salts produced from different sorts of wood, growing in this country. The results
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the manner of burning wood, either abroad in the open air, as in clearing up the land, or in chimneys, for common fuel, it is evident, that when reduced to wood ashes, the contained salt must be blended with a variety of substances, which constitute its impurity. In this state the manufacturer receives it. It is his business to free it from these foreign substances; and in proportion as he effects their separation, will be the excellence of his Pot or Pearl Ash.

Although these substances of impurity are almost infinite, yet they may be classed under three heads; 1st. Some earthy substances insoluble in water. 2d. Colouring matter. 3d. Neutral salts.†

As the difference between Pot and Pearl Ashes has been stated to be but a different manufacture of the same salt; whereby it acquires the different properties already noticed, the two processes for their manufacture must be treated of separately; therefore, the first observations will be confined to the process for the manufacture of Pearl Ash.

Experienced

he has been careful to preserve, as useful knowledge, which, together with other facts his accurate observation has furnished, or his experience confirmed, it is hoped he will be induced to communicate.

† Another source of impurity not mentioned above, though it might be comprehended under the article, colouring matter, is from iron; this united with alkaline salt, fixes so strong a dye, that the best mode hitherto practised for its separation will not indemnify the manufacturer of Pot Ash, for the trouble and expense of it. Therefore, although even this may be separated with great care and trouble, it will be most for his interest, whenever the water to be made use of in leeching is found to be from a spring impregnated with iron, to seek for a new supply where it may be had more pure, or give up the attempt to make good Ashes,

Experienced manufacturers find an essential difference in working wood ashes that have been collected from abroad, or that have been long exposed to the air; and those that are recently made under furnaces, or even in common chimneys. They remark, that salts from wood burned abroad, when clearing up the land, will not easily melt, but will pearl without difficulty, and are often determined in their arrangement for making Pearl or Pot Ash, from this circumstance. Many conjecture the cause of this difference to arise from the common earth or dirt which unavoidably mingles with wood ashes when collected from the ground. But as leeching them and settling the lye, so as completely to separate all that is earth from the salts, does not dispose them to melt, this opinion appears without foundation.

The true cause is the principle already hinted at. It is the combination of the aerial acid, which is made evident by a variety of experiments, shewing, that wood ashes, when exposed to the air of the atmosphere, freely imbibe this principle from it, and that depriving them of this principle, is sufficient to render the alkaline salt from them caustic, and disposes it to melt.



The PROCESS for the MANUFACTURE of PEARL ASH is carried on by several operations:

LEECHING,

LEECHING.

THE first consists in dissolving and washing out all the salts from the indissoluble earth or dirt, with pure rain or river water, if to be procured; in filtering, or straining it nicely, and in letting all sediment subside, or settling the lye. This is called leeching the wood ashes.* It is so well understood and practised by many of our manufacturers, that it would be unnecessary to be minute, did not too many adhere to the old mode of sinking huge leeching vats under ground. Defects in them are thereby so concealed, that a great loss of lye may be sustained before the workman discovers the leak. The heavy compact mass they contain, is not so easily soaked and washed as a smaller body: not readily admitting the water throughout its whole substance, passages are sometimes formed by gutters through various

* It has been strongly recommended to begin this manufacture by calcination, or burning the wood ashes in an oven or furnace. But the experiments hitherto made, have only served to prove this an expensive and troublesome mode, without the advantage boasted of and promised by Mr. S. Hopkins, the author of this supposed improvement.

Water is the proper solvent of all salts, and where the combustion and incineration of wood ashes has been complete, it is a fact not to be controverted, that boiling water will thoroughly dissolve and wash out all the salts, of every kind, blended with the earth in wood ashes. If the wood has not been completely reduced to ashes, but to ashes mixed with coals, then would it not be better, by sifting them, to separate the coals, which, thrown under the furnace for fuel, would be calcined with profit? Another advantage to be derived from this mode would be, lessening the quantity of colouring matter that is imparted by coals, &c. therefore would facilitate an after part of the process.

various parts of the vat, where any quantity of water will run without penetrating beyond the neighbourhood of the channels it has made ; and although the water passes through the ashes until it becomes tasteless, and receives no augmentation of weight (which is the criterion to determine when wood ashes are leached) yet much of the contents of such a vat may be strongly impregnated with salts.*

A more important objection is, that the lye after it is strained and settled cannot be brought to the kettle in that state of purity that is necessary, unless it is settled again ; for it must be drawn up from the cistern by the suction of a small pump, or dipped out with a bucket or ladle, either of which, however carefully performed, disturbs the sediment, that is always deposited, although the lye has been well filtered, and renders it foul, beside occasioning an increase of labour.

Leeching

* It is not improbable that some partial experiments with wood ashes, thus imperfectly leached, may have given rise to the opinion that dead ashes (i. e. such as already have been leached) might, under the operation of the supposed improved mode of burning ashes, afford a sufficient quantity of alkaline salt, for another manufacture of Pearl Ash.

However the opinion of this extraordinary creation of alkaline salt prevailed ; its effect was, that although the rational foundation of hope and expectation, (i. e. that the principle on which the new product was to be obtained) was concealed in profound mystery, hereafter to be revealed ; the idea was so captivating as to engage numbers in a new project, who destroyed their well constructed furnaces, to erect such as on experiment became useless, and entered into incredible contracts for leached ashes, that would not pay for their transportation. Within the term of two years, this business terminated in disappointment, to the loss and mortification of all who pursued it.

Leeching is better performed in vats placed above ground, where they are always under the eye and examination of the workman. In small vats, the wood ashes can be more easily and thoroughly drenched than in large ones; instead of vats that will contain 80 or 100 bushels, those that do not exceed 30 are to be preferred.

Each vat is to be provided with a false bottom, so tightly placed above the true one, as to admit nothing below but what is dissolved and carried down by the water; for this purpose, there should be a number of small holes, cracks or channels, in the false bottom, covered over with straw, to prevent the passage of the earth while it admits the lye.

The distance of the false bottom from the true one (which forms a receiver for the lye, and is called the cistern of the vat) should not be less than six or eight inches, that the sediment which falls, may rest at the bottom of the cistern; while the lye is drawing off from a faucet placed at a convenient distance above it. The upper part or body of this vat is to be filled with the wood ashes, within two or three inches of the top, and as much water is to be poured on them as they will absorb, and will cover them to the brim of the vessel. This done over night, the lye may be run off in the morning.

The number of vats should be in proportion to the extent of the manufactory, and the number of kettles employed, so that there may be a constant

constant supply of strong lye, for boiling down. This part of the business should be managed after the manner practised in distilleries, to have a succession of a certain number of vats ready to work off, and furnish every day's boiling : and where it is practicable, they should be so arranged that the lye may be conveyed from one vat to the other, and from them into the kettles by a spout.

Whenever the lye toward the close of leeching becomes so weak as not to pay the expense of time and fuel to boil it down, it should be thrown on to another vat until it becomes tasteless, and receives no augmentation of weight by the leeching. The vat is then to be emptied, the false bottom taken out, the whole examined and cleansed for use again.

The foregoing operation gives a solution of all the salts of every description that were contained in the wood ashes, effectually separated from the earthy impurities, but yet combined with the colouring matter. This solution is next to be boiled down to the consistence of brown sugar, to prepare the salts for the first calcination or scorching, which is the second operation, designed to separate and destroy the colouring matter, and convert black salts into white. This colouring matter, known to workmen by the name of sulphur, sometimes improperly called the *caustic sulphur*, or *oil*, has been denominated, by the most celebrated chemists, the inflammable principle, and

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The furnaces in common use for scorching and pearling, are well constructed; they completely reverberate the flame on the salts, at the same time that they admit a continued stream of air necessary in this operation, which is a genuine calcination, and cannot otherwise be performed. In this situation the salts are to be frequently stirred, that every part of them may present its surface to the two powerful agents. A strong fire may be applied, but not so intense as to melt them. When the salts have this tendency, the greatest care must be taken to avoid it, by moderating the fire, and by keeping the door of the furnace open, to expose them still more to the air; for if they begin

† Chemical Dictionary, Article Prussian Blue.

begin to run, it is difficult to proceed with the operation, which, if imperfectly performed, must disappoint the hope of the manufacturer for a successful termination of the pearling process.

This first calcination is known to be finished, if the salts, when wet or dissolved, have lost the strong disagreeable smell of black lye, as well as the colour, which is now changed for white.

TO SEPARATE NEUTRAL SALTS.

THE next operation is, to wash away the colouring matter that has been separated, though not completely destroyed by scorching, and to separate the neutral salts.

These objects are very conveniently effected at one and the same time, simply by solution, in such a quantity of boiling water as will take up the alkaline salts, but when cold will not hold the neutral salts in solution. This point is attained sufficiently accurate for this manufacture, and depends on the different degrees of solubility of different salts.* When

* Several kinds of neutral salts are found with the alkaline salt leached from wood ashes; they vary in their quantity and proportion from a variety of circumstances, according to the kind of wood they are made from, and the state of it when burned. From old dry perishing wood, the neutral salts are in great abundance: If the wood has long been soaking in sea water, uncommon quantities of marine, or sea salt, will be found. Water from wells and springs dissolves different salts it meets with in its passage through the earth, and when made use of instead of rain or river water, it increases the neutral salts,

When salts produced from good sound wood are fairly made, without any designed adulteration, a solution of them that will weigh a very little more than one quarter heavier than the same measure of pure rain water, when drawn into a receiver, where it must be at rest until cold, will deposit the neutral salts in chrystals round it; and while this is taking place, if the salts have been well scorched, the remaining colouring matter, and all sediment, will be found to have subsided at the bottom of the receiver.

Here it cannot be too strongly impressed on the workman to avoid every thing that will in the least degree disturb the sediment. It is an object so important to be attended to, that it cannot be amiss to repeat the injunction on this head, that he ought never to take this lye from the receiver by pumping or dipping. He will ever be apt to dip too near, and the smallest quantity

salts, and sometimes diminishes not only the proportion, but the absolute quantity of alkaline salts already obtained in the wood ashes. Those acquainted with the nature of salts readily perceive how this must happen, when a neutral salt, with an earthy basis, is dissolved in an alkaline lye. The earthy part of the neutral salt is dropped and exchanged for a portion of the alkaline salt taken up to form a new neutral salt.

This lessens the quantity of alkaline salt by as much as is taken up to form the new combination, and in exchange for it is added the earthy impurity, while, although the kind of neutral salt is different, the quantity remains the same. On a fair calculation, this will be found to cause no trivial deduction from the real quantity of alkali which might be obtained from the same wood ashes if pure rain water was used. On an average five hundred bushels of wood ashes are drenched and leached for a single ton of Pot or Pearl Ash.

quantity of sediment raised, will diffuse through the whole such a dull white appearance, more or less inclining to grey, as induces a suspicion in the purchasers of Pearl Ash, particularly on the other side of the water, of a mixture of lime, which suspicion has depreciated great quantities of ashes otherwise good.

This is easily avoided, by drawing off the white lye from a faucet placed above the sediment, as described under the head of leeching.

It cannot be objected to the above mode of separating the neutral salts, that some small portions of the alkaline salt will be thrown down with them; because, washing the crystals of neutral salts in cold water, not sufficient in quantity to dissolve them, will dissolve the remaining alkaline salt, which, with the sediment, may be thrown on to one of the vats for a new process. By the above mode may be drawn off into the kettles, nicely cleaned to receive it, a pure white lye, to be boiled again down to salts for the finishing operation, which is the second calcination, called pearling.

P E A R L I N G.

IF scorching has been well performed, the pearling operation is made easy; being little more than drying the white salts in the pearling oven or furnace, with a moderate clear flame. It is

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an operation similar to scorching, but does not require the same force of fire; the salts having been previously freed from their impurity. When boiled to the consistence of salts, they are to be thrown into the pearling furnace, and continued under this last operation in the manner they were scorched, until they are perfectly whitened, and found to be of the description of the first sort of Pearl Ash.

It is to be again noticed, that as some salts are found more tender than others (i. e.) more disposed to melt, they require more particular care and attention to moderate the fire and increase their exposure to the air.

There is another mode of pearling much practised of late, which will be found exceptionable, whenever the requisites for this operation are taken into consideration. It has already been observed that pearling is a genuine calcination; and, that a continued stream of air is so necessary in the operation, that it cannot otherwise be performed. It is evident that this cannot well be had in the bottom of a deep kettle; for, when heated, the air is expelled from it. A broad or shallow pan would answer better; but no contrivance can exceed the furnace that will throw a clear flame directly upon the salts.

Beside that it is impracticable to expose the salts to such currents of fresh air in the kettle as in the furnace; it is obvious, that when the fire under the kettles is likely to be raised too high,

high, by the time the operator is apprized of it, it is often too late to prevent the mischief it must occasion, on account of the continuing heat of the iron. Therefore, the salts, for want of sufficient exposure to the air, and by reason of too great heat, have not imbibed their portion of the aerial acid, and are thereby rendered caustic, and more disposed to melt.

Hence the reason, that, although two or three manufacturers, by extraordinary care and caution, have produced Pearl Ashes of the first sort in this mode; yet, in this way, great quantities have been sent to market imperfectly pearled; much of it fine, not well dried, heavy, and like meal of a yellow tinge; while the lumps beginning to melt, are externally hardened, and of the same or a greenish hue.

The causticity of this kind of ashes gives it an appearance of greater strength. But this property cannot be a recommendation of it, while those who use it for nicer purposes, where the *mild* alkali, or first sort of Pearl Ash, is required, find it too corrosive, or sharp, for their work.

This kind of kettled ashes is in disrepute in the London market; and on account of its corrosive quality, is sometimes suspected of being heated with lime. This suspicion, however, must be groundless; for, did the manufacturer attempt to use quicklime in *kettling* ashes, it would inevitably melt the salt.

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To finish the observations on the manufacture of Pearl Ash little remains to be said, except what relates to putting it up or packing it for the market. Neatness in this part of the business quickens the sale, and often enhances the price of the article, above the difference made in its intrinsic value. The eye of the purchaser, particularly in the London market, is prejudiced, beyond what is commonly imagined, even against good ashes when not shewn to the best advantage.*

If Pearl Ash is tight packed, the lumps are broken, and it is made fine : It is true the property of it is in no degree altered ; it is equally as good for every possible use as though it were in large lumps, smoothed by rolling loosely in the cask ; yet it does not meet with the same approbation, and has been frequently complained of.

A want of neatness, which proves an essential injury to Pearl Ash, is frequently occasioned by a mixture of scorched salts : it is impracticable to separate them when repacking, especially if the Pearl Ash has been pounded almost to powder, to crowd the greatest possible quantity into a cask. This impurity is too often in such proportion as to denominate the Pearl Ash second fort.

* A letter lately received from a house in London that perhaps deals as largely in ashes as any one house in Europe, contains the following observation. " Small ashes, however pure, will not recommend themselves in England like bold ashes of a good colour."

fort. To prevent it altogether, it is found most convenient and best to use separate furnaces ; one for scorching, another for pearling. Where the business is not sufficiently extensive to afford the expense of two, the single furnace, after it has been used for scorching, should be most attentively examined, and thoroughly cleansed of all remains of scorched salts. The hearth also should be noticed, and repaired if necessary, that there may be no pieces crumbled from the bricks of the furnace found amongst the Pearl Ash.*

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* Sometime in the course of the last season, amongst six or seven casks of Pearl Ash sent to the Inspection Store, one of them was marked second fort ; because, with the Pearl Ash, there were small pieces of brick and mortar that had crumbled from the inside of the furnace, interspersed throughout the cask. The person who brought it, alledged that the Pearl Ash being very good, so trifling and accidental a mixture could not materially injure it for use ; therefore the second fort brand would depreciate the value of the Pearl Ash, and not the few foreign substances found with it. The owner and the Inspector, as is very common, differed in opinion, and the Pearl Ash passed as second fort.

A workman from the glass house came to the store, examined for himself, and liked the appearance of this Pearl Ash, and it was purchased for that manufactory.

When the melted composition, wherein this was an ingredient, was to be blown into plates of glass, it was snapped in pieces by the brick, before the plates could be formed. By which mischief the blast was lost, and the proprietors, from this single cask of Pearl Ash, in one evening sustained an injury to the amount of between 30 and 40 dollars.

BY a different process the same alkaline salt is obtained in a caustic state, and is called

P O T A S H.

IF the essential difference between Pearl and Pot Ashes is the comparative *mildness* of the one, and the *causticity* of the other ; and if the mildness of the alkali in Pearl Ash depends on its combination with the *aerial acid* (a principle it absorbs from the common air, or from *hard* water used in the manufacture of Pearl Ash) we are at once presented with a key to that mystery whereby good Pot Ash can *always* be made.

Prevent as much as possible the combination of this aerial principle with the alkaline salt, while passing through the different operations, to free it from its impurities : deprive it of what it unavoidably catches, and the process must be successful.

To prevent then this combination, the wood ashes, or the salts from them, should not be exposed to the open air ; for although the free admission of air is requisite in calcination, as has been insisted on throughout the pearling process ; the exclusion of it in fusion, facilitates that operation ; and *melting down*, as it is termed, is well known invariably to succeed better the less the external air is admitted. The only reason why alkaline salts should be melted into Pot Ash, is, that by the force of so strong a fire,

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the aerial acid may be expelled, that the alkaline salt may present as small a surface to the air as possible, and thereby retain its remarkable causticity.

This remarkable property is greatly increased by the use of quicklime, which property also increases the fusibility of the alkaline salt, or its disposition to melt ; therefore to deprive the alkaline salts of the aerial acid which they had imbibed from the air, or from the hard water used to dissolve them, quicklime may be used, not only without injury to the Pot Ash, but with advantage.

There is no substance in nature known to possess so great a share of the aerial acid in its composition as that which makes the best of quicklime. This aerial principle being expelled from *limestone* by fire, in the manufacture of quicklime, it becomes a *caustic* substance, ever ready to regain its natural state ; and it will most greedily absorb what it has been so violently deprived of, whenever circumstances favour it.

Present alkaline salts in a *mild* state to quicklime, and in proportion as they possess this aerial principle, it will be restored to the quicklime, which will thereby become mild, or slacked, leaving the alkaline salts possessed of their original caustic property.

The foregoing principle admitted, directs to the proper use of lime, and shews that after it has
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thus acted on the alkaline salts, it serves only as a strainer, and therefore the lye ought to be as carefully drawn from it, as from any other earthy impurity. It also shews the advantage that will result by excluding the air as far as practicable, from the wood ashes designed for this manufacture, from the lye, and the salts, through every operation of the following

PROCESS, for the MANUFACTURE of POT ASH.

THE first operation consists in *leeching*, as for Pearl Ash.

This has been so particularly treated of, that a repetition would be useless, although the most minute attention to every circumstance there noticed, is indispensable. A difference too, to be observed, is, that here unslacked lime may be used. The straw upon the false bottom of the vat is to be covered first with wood ashes, then as much unslacked lime is to be thrown over it, as, when slacked, will make a layer of three or four inches; that the lye passing through may not only be strained, but that it may acquire a more caustic quality. An additional quantity of lime may sometimes be requisite to be thrown into any part of the vat with the wood ashes, when they have been rendered more mild than usual, by long exposure to the air.

When

When the lye is leached and settled, it is to be drawn off into the kettles, and boiled down, for

THE SEPARATION OF NEUTRAL SALTS.

THE boiling is to be continued until a scum is observed to collect on the surface of the lye, or, until it will weigh a little more than one quarter heavier than pure rain water. It is then to be taken from the kettles into a receiver, where it is to be again settled by throwing into it another quantity of lime, unslacked,* to increase its causticity. The

* Here an enquiry presents itself that may be thought to deserve more particular discussion. How much quicklime is to be used in a given quantity of lye? No explicit answer can be given to this question. No definite quantity can be determined on for different parcels of lye, which already, without the addition of lime, possess different degrees of causticity. (e. g.) From wood ashes recently burned, immediately taken from under a furnace before they are cold, and carefully leached with pure rain or river water; or, if early in the season, even with good spring water, no quicklime will be requisite. The salts have not been exposed to absorb the aerial acid, they will therefore be sufficiently caustic, and will melt like oil. Take wood ashes of the same description, that have been exposed to the air for months together, let them be leached in the common mode, with water from the same spring in autumn, when it runs low and becomes hard; the salts will have absorbed so much of the aerial principle from the air, and from the water; that unless quicklime be used to absorb it from the lye again, they will prove extremely hard to melt.

A simple experiment will shew the difference between the two lyes, and tends to establish the principle, that the state of the last lye depends on the aerial acid. To a glass of it, pour by degrees a little sharp vinegar or other acid, and it will immediately be thrown into a violent state of effervescence, caused by the sudden expulsion of air the alkali has absorbed, which must give place to the new union with a stronger acid. But if the alkali is completely caustic, no such effervescence

The receiver is to be covered, where the lye should rest until it is cold, when it is to be drawn off as carefully from a faucet placed above the sediment, as directed for the white lye, designed for Pearl Ash. In this way the neutral salts and all sediment will be left in the receiver, and the lye prepared for the last boiling. For this, the utensils, the kettles, and every thing about them, should be very clean, that no impurity fall into the lye. After it is drawn off and conveyed again into the kettles, they should be covered until the lye begins to boil, that it may not lose of its causticity. The covers may then be taken off, to favour its evaporation. When dried down to salts, the fire is gradually to be raised; the kettles again covered for

MELTING.

IF the precautions recommended have been duly attended to, this operation, often tedious and expensive, hazarding the loss of kettles, and perplexing the workmen, becomes at all times easy and expeditious, and *melting down* terminates the process to the complete satisfaction of the operator. For by the time the alkaline salt is well melted, the last impurity, the black colouring matter is destroyed; but, if the alkaline salt

effervescence is seen immediately on the mixture of an acid; there is no air to be expelled, and the union of the acid with the alkali quietly takes place.

When then a violent effervescence suddenly commences on the mixture of an acid with the alkali, quicklime may be added to the lye with advantage.

salt is not caustic; by being kept or freed from the aerial acid, and the neutral salts have not been separated; it is extremely hard to melt. And the black colouring matter* is so strongly united to it, that if after a tedious length of time with excessive fire, it is melted without breaking the kettles, the Pot Ash will be found red and foul, although the lye has been leached and settled in the most careful manner.

Dr. Lewis, one of the most eminent of modern chemists, in his valuable little treatise on Pot Ash, observes, when treating of the mixture of sea salt with American ashes, that "as almost all the common sorts of sea salt participate of the bitterness of sea water, the combination of the vitriolic acid of that salt with the inflammable matter during fusion is probably the origin of the sulphureous taint;" (*i. e.* the black colouring matter) "in Pot Ash." If this is true, we are taught to explain the effect that all other neutral salts, as well as sea salt, have on

Pot

* This colouring matter has been improperly called the *caustic* sulphur, and the *caustic* oil, from a conjecture that it was the cause of *causticity*. This error probably was suggested by observing that black salts oftentimes retained a considerable degree of caustic sharpness, which they lose at the same time the colouring matter was destroyed by calcination. However respectable the authorities are that formerly held this opinion, it is now a fact well established, that the *causticity* of the alkaline salt does not reside in the inflammable principle (*i. e.* in the black colouring matter) but that it is really diminished in proportion as the inflammable principle abounds.

Neither has this colouring matter the properties of an oil—if it had, it would invariably form soap by its union with the alkali.

Pot Ash; for all other neutral salts found with the alkaline in wood ashes, are combinations of the vitriolic acid with different bases; therefore, the same effect is to be expected from the vitriolic acid in their combination, as from the same acid combined in the bittern of sea water. Again, if hard water has been made use of instead of soft, it has a similar effect on the Pot Ash; the salts are very hard to melt, and the black colouring matter remains; and it becomes almost impossible by the common mode of manufacturing to destroy it.

Water is made hard, not only by neutral salts, but by the aerial acid.*

Well and spring water, although at sometimes sufficiently soft and pure, when the springs are low, become hard by this impregnation.

Here is disclosed the mysterious cause of Pot Ash salts melting easier in the spring and the fore part of summer, when the whole earth is filled with water, than at the close of the season, when it is much exhausted, and the springs run low. At this latter season most spring water is hard, and it is generally said to be impossible to make good Pot Ash. Although rain or river water is always to be preferred where it can be had, especially at the season when it is thought impracticable to make good Pot Ash: Yet, indisputable experiments have proved, and must convince all who make

* The gas, which waters frequently contain, is another cause of the hardness of water. Chemic. Dictionary. Note to the article water.

make them fairly, that, according to the foregoing theory, even lye made with spring water may be so deprived of neutral salts and the aerial acid, as that Pot Ash of a *superior quality* may easily be made at *any* and *every* season of the year.

If this is well understood, the workman will no longer be astonished that his Pot Ash has sometimes proved bad ; although, as he supposed, he had used the same method to cleanse it, (i. e. he had leached, settled, and drawn the lye from all earthy impurity in the same manner) as when it turned out good. He will hereafter regard the neutral salts as an impurity, and attend particularly to their separation, while through the whole process he strives to prevent the union of the aerial acid with the alkaline salts, or carefully deprives them of it when unavoidably combined. This done, melting down will soon be effected, by gradually raising the fire until a red heat is produced. Except when there is occasion to examine the melting mass, or to stir it together with a ladle, it should be kept covered, increasing the fire until it becomes an uniform thin fluid.

Iron kettles for coolers are now to be made ready, by heating them at the mouth of the furnace. A little tallow may be lightly rubbed over the inside surface of them, to prevent too strong an adhesion of the Pot Ash to the iron, which sometimes happens and is troublesome. The furnace is to be well tended with a continual supply of dry fuel to keep up a very brisk fire, to-
ward

ward the close of the process. In this state, the melted salt need be continued but for a short time to destroy the inflammable principle, or black colouring matter; the destruction of which may be known by the easy experiment of making a very strong solution of the Pot Ash in a cup of water, immersing therein a piece of silver or bright tin; if by this, the metal is not tarnished, the process is finished; and the Pot Ash is immediately to be dipped off into the coolers, taking especial care not to suffer the least abatement of fire until the kettles are emptied.

When the Pot Ash becomes hard in the coolers, and cool enough not to endanger burning the cask, before it has attracted moisture from the air, it should be packed in dry, tight, new casks, that the air may not form a crust upon its surface.

One general observation applicable to most kinds of business is peculiarly adapted to both the preceding processes, viz. that every operation well conducted, makes easy and shortens those that come after, and is of so much consequence to the succeeding ones, that it is best to repeat it, whenever any one is interrupted.

Such management of the business, will, at once, put an end to all well grounded complaints, against ashes, exported from Massachusetts. Instead of *second* and *third sort*, which are a dead loss to the manufacturing interest, there need not be a single cask but of an excellent quality. We shall no longer hear of "mixed parcels of ashes,"

es," so various in their appearance, as to beget unfavourable suspicions of their being the genuine salt. And a faithful comparison with the exports of our sister State, New-York, formerly our rival in this important branch of commerce, will cease to be to our disadvantage. And while there is a market for ashes, those exported from Massachusetts will meet with a quick sale, and at the highest price. Added to this, which is perhaps the strongest and most persuasive argument for the mode of manufacturing on the principles here advanced ; experience will prove it less troublesome, more expeditious, and less expensive, than to manufacture such ashes as turn out of inferior quality, and are denominated second and third sorts.

EXPERIMENTAL

EXPERIMENTAL ASSAY OF ASHES.

THE several operations to free ashes from impurity, point to "the more effectual inspection of the same;" whereby the quality of any parcel may be more fully ascertained.

A solution of Ashes in rain water will determine what proportion of sediment, or indissoluble foul earth, is enveloped with the salt. By filtering it through loose wrapping paper, what remains on the filtering paper may be accurately weighed; it will also shew the black colouring matter of red Pot Ash floating in the solution, like a mixture of lampblack. The weight of this impurity being comparatively nothing, the degree of foulness is judged of by the deepness of the dye.

Except sea salt, the neutral salts are easily discovered by the ready method practised by Mr. Blodget: It is to dissolve as much ashes as can be taken up in a tumbler of boiling rain water, and to cool it suddenly by immersing the tumbler into cold water. The neutral salts will hastily shoot, and form an apparent congelation. Sea salt, not being obedient to the same law, but being equally soluble in cold as in hot water, is not discovered by this mode; but by slow evaporation.

Sea, or common salt, is seldom found in quantity, either in Pot or Pearl Ash, unless added by design. A pretext is sometimes made use of, that it facilitates the melting of Pot Ash. Some have
been

been induced to believe this, but they have deceived themselves ; and where melting is the only aim, a single fair experiment will determine them to give up the practice, in favour of the prudent use of quicklime, previous to the melting stage of the business.

If Pot or Pearl Ash is overcharged with neutral salts, it is suspected by the touch and taste. If instead of the *caustic* alkaline salt, any other salt be mixed in Pot Ash, it will not give that acute sensation of heat, on handling, or to the taste, as the genuine salt never fails to excite ; for all neutral salts, except the *metallic*, excite rather the sensation of cold than of burning heat. The adulteration with common salt has this effect on the Pot Ash in a remarkable degree. A solution of Pot or Pearl Ash, containing common salt, may also be discovered by its taste, if compared with a solution of ashes known to be free from it : And if these solutions are made in six or eight times their quantity of pure rain water the difference will be very distinguishable. The degree of adulteration may be found by evaporating a solution of ashes very gradually, until the neutral, and of course the common salt, will crystalize, while the alkaline is held in solution.

But, as the quantity of alkaline salt is the object of the assay, and not what are the different kinds of neutral salts blended with it, in Pot or Pearl Ash ; the peculiar properties of that salt furnish another mode of examination that cannot deceive.

Alkaline

Alkaline salt is well known to possess the strongest disposition to unite with acids, to a certain point called *saturation*; which totally destroys the properties of both, constituting a neutral salt: until sufficient acid is added to the alkaline salt to bring it to this point, the alkali predominates, and the mixture retains its alkaline character; beyond it, the acid prevails.

A clean solution of Pot or Pearl Ash, freed from all sediment, contains nothing but salt. The question is, what portion of the contained salt is alkaline? Add an acid until the solution is neutralized, and mark the quantity of acid consumed. If neutral salts have been already blended in the solution to be assayed, it is plain it will not take up as much acid to saturate it as an equal weight of a solution where no neutral salts are blended. Those ashes therefore which will take up the greatest quantity of acid to saturate them, contain most alkaline salt.

The point of saturation is pretty well known by the taste, to those accustomed to compound acids with alkalies. The sour sharpness of the one, and the corrosive heat of the other, are not to be distinguished in the saturated mixture, because they have destroyed each other. A cessation of the effervescence that takes place on the union of an acid with a *mild* alkali, is the usual method to determine this point. But, if the alkali is completely *caustic* no effervescence takes place, for want of the *aerial acid*, that, discharged by the union

union of the *mild* alkali with a stronger acid, occasions its effervescence.

The distinct properties of acids and alkalies in their action on the blue juices of vegetables, have enabled chemists to come at this point of saturation with the greatest exactness.

Alkaline solutions will invariably change the blue of vegetables to green. Acids will change the same blue to red,* while the neutral salt resulting from a saturation of the two, produces no alteration of colour.

Tinge a solution of alkaline salt, green, with some vegetable blue, add an acid until the blue colour is recovered, and the point of saturation is gained. If more acid is added the solution will redden.

The infinite variety of blue flowers, in the season of them, will supply the blue colouring matter

* Professor Bergman says, "The general rule, namely, that blue vegetable juices are made red by acids, and green by alkalies, is liable to two exceptions, already known, viz. lackmus is rendered more intensely blue by alkalies, and indigo dissolves in vitriolic acid without any change of colour." Vol. II. page 129.

What is said of lackmus and indigo is undoubtedly true; still it does not furnish any exception to the general rule, when it is remembered that neither of those substances is of the blue vegetable juice in its original state. Lackmus is a preparation of the vegetable called Archil, which vegetable, in its natural state, gives out a red colour; but when bruised, and the red juice is treated in a certain way with lime and volatile alkali, and evaporated to a consistence, it is changed into a blue pigment called Lackmus.

Indigo is well known to be obtained from a vegetable, by fermentation; and fermentation totally changes the property of every vegetable and animal substance.

ter for this test. But they are not always to be had fresh; lackmus, a preparation of archil, is recommended because it is not so perishable.—In want of these, during the winter season, I accidentally made use of the red cabbage; a strong infusion of it in rain water gives a good blue; and I since find this vegetable recommended in preference to all others, for the trial of alkalies and acids.

It is simply prepared by pouring boiling water upon the red cabbage leaves, cut small, and let stand until cold, when it may be poured off for use.

Any acid may be made use of, even vinegar. The marine acid, called spirit of sea salt, as sold in the apothecarys' shops will be found preferable to any other, for the purpose.

Add to one part of spirit of sea salt, ten parts of rain water, and the acid will be reduced to a suitable strength for the trial.

To ascertain with the utmost precision the *absolute* quantity of what is purely alkaline in any solution of salts, requires so minute an attention to every variation of temperature from hot to cold; to the different degrees of pressure of the atmosphere, in damp or dry weather, and to the precise strength of the acid made use of, as cannot be had without the assistance of expensive instruments; and would prove much too tedious and troublesome for common business.

Chemists.

Chemical and philosophical researches require this accuracy in experiments, lest erroneous deductions should be made from their results. But it is by no means necessary to be thus scrupulously exact to determine the purity and consequent comparative commercial value of Pot and Pearl Ashes. This may be done with great ease and certainty, and with little apparatus. The apparatus need consist only of a little vegetable blue, and some acid prepared as above—two or three glass tumblers, a vial that will contain four ounces of rain water, and a small pair of scales and weights; the weights to conform to the vial and contained water: *e. g.* one weight that will exactly balance or tare the empty vial—one that will weigh precisely as much as the quantity of rain water the vial will contain, *i. e.* four ounces.

The four ounce weight may be marked 128

One two ounce do. do. 64

One ounce, 32

One half ounce, 16

One quarter ounce, 8

One eighth, 4

One sixteenth of an ounce, 2

One thirty-second, 1

By thus marking them they may be denominated carat weights.

Take then one ounce, or thirty-two carats of such Pot or Pearl Ash, as having been faithfully made from good wood ashes, is known to be of the best quality. Let it be pulverized, that
solution

solution may be more speedily made) make the solution of it in a tumbler, in four ounces of pure rain water.

Take also an ounce of the Pot or Pearl Ash to be examined, make a like solution of it in a second tumbler in the same quantity of rain water. When the solutions are complete, and the sediment of each has subsided, pour carefully from the first tumbler half an ounce, or sixteen carats by weight, of the clear solution; add to it one tea spoonful of the vegetable blue infusion—take by weight of the prepared acid—add of it gradually to the solution that has in it the vegetable blue, and it will be found gradually to change colour, until, by repeated addition, the blue colour is restored, which shews the point of saturation. The last additions should be made with great caution, or too much acid will suddenly change the colour of the solution to a deep red. To carry this test to a point instantly discernable, I have generally added the acid until it gave the solution the first tinge or blush of red, which although a degree beyond saturation, is as precise a point, and easily determined. After this, the remaining acid is to be carefully weighed, and the quantity consumed in the trial to be noted.

Proceed immediately to the examination of the solution in the second tumbler. Take the same quantity, i. e. half an ounce by weight. Use the same test, and when, by the same caution, under

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similar

similar circumstances, the solution is brought, by the acid, to the very first blush of red, weigh the remaining acid, which will shew the exact quantity consumed.

If then the sixteen carats weight of the solution of the first tumbler, which may be called of the standard ashes, has taken up forty carats weight of prepared acid; and the same weight of the solution of the second tumbler, has taken but thirty-six carats to bring it to the same point, it is plain, that although the quantity of salt contained in each be the same, yet, of the salt that is valuable, i. e. the alkaline salt, there is a difference between them of ten per cent. The remaining salt of the second ashes being of a different kind, shews the existence or mixture of some neutral salt that ought never to have been blended, or should have been carefully separated in the manufacture.

Every expense on such ashes (the original price of the stock only excepted) being the same with the first, the profit of it must be much reduced.

In this way may be determined the comparative worth not only of Pot and Pearl Ashes, but of all Pot Ash Salts; and the manufacturer need no longer be subject to imposition in the purchase of them. A very little practice will familiarize and make easy the trial, and it will be found sufficiently expeditious. Those who collect ashes at the stores in various parts of the country, may have it in their power

to

to ascertain the quality of their purchases : and the exporters, if they please, may determine, as well as the Inspector, what ashes will be most profitable to the consumer. The manufacturer likewise may always know how his ashes ought to be received at market ; and blind indeed must he be to his pecuniary concerns, if ever he suffers ashes of the *third sort* to be sent from his works. Let him rather, if by accident he is unfortunate in a process, and his ashes prove third sort, keep the advantage of working them over to himself : This will at all times afford him greater profit than to dispose of them in any other way.

Well persuaded that nothing is wanting but the practice, to convince of this fact ; may we not expect the time, which probably is not far distant, when what are now denominated *third sort* of ashes, may not be known or heard of in the Massachusetts market ?

APPENDIX.

A P P E N D I X.

PEARL ASH FURNACE.

IT is not easy to give an accurate description of a Furnace, unless by reference to a plate where it is delineated. A general idea, however, of the Furnaces employed in the business treated of, may not be altogether useless.

A Furnace, whether for scorching or pearling, should be exactly of the same construction: It is properly called a *reverberatory Furnace*, and differs very little from the *reverberator Furnace* "said to be the invention of an English physician of the name of Wright: the use of which was first introduced in England for smelting ores, about the end of the last century."*

To describe the pearling Furnace in a more familiar manner:—The form of the body of it may be said to be very much like a baker's oven, open on one side. The greatest extent of the hearth is in length six feet, in width four. The fire place and ash hole are on the side of the opening. The fire place is separated from the body of the Furnace by a partition wall, raised about two or three inches from the hearth, running along the whole length of the side. This wall leaves an opening of about four or five inches above it, for the passage of the flame to the body of the Furnace. The grates to support the fuel

* Macquire.

separate

separate the fire place from the ash hole, and should be sunk about six or eight inches below the level of the hearth.

Formerly the pearling Furnace was built with a fire place on each side ; but of late, the fire place on one side is found equally to answer.

The distance of the roof on the inside of the Furnace, from the hearth to its crown or highest part, should not exceed fourteen or fifteen inches.

It is usual to have two chimneys to the body of this Furnace ; one at the entrance, to receive the flame and smoke, when the door is open ; the other opposite to it, at the farthest end.

This Furnace has also two doors ; one at the fire place, about 12 inches wide, another at the opening at the front of its body, about 18 inches wide, and ten high ; through which the salts are thrown into it.

The fire is led to play throughout a well constructed Furnace, by three or four flues judiciously disposed around it, at the bottom of the wall, directly upon its hearth. These openings communicating with the chimneys, cause a draught which circulates the flame over every part of it.

P O T A S H F U R N A C E .

THE Furnace in use, for manufacturing Pot Ash, is of a different construction. It consists of two large iron boilers, or kettles, set in brick work,

work, that will hold from 50 to 70 gallons, measuring about three feet over the top; they should be very thick at the bottom to endure the fire, and provided with covers of plated iron. Under the kettles is the fire place and ash hole. At the mouth of the fire place is the door, at the farthest end of it is the chimney. The grates that separate the fire place should be sunk below the bottom of the kettles at a distance not exceeding 14 inches; the width of the fire place door should be about 18 inches.

It is easy to conceive that by this construction, whenever the fire is urged so strongly as to produce a red heat in the kettles, and sometimes beyond it, that the draught from the ash hole will drive a great portion of the fire into the chimney, and even force the flame out at the top to a considerable height. This is what generally happens on *melting down*.

Being desirous to attend particularly to this operation, and aware of the inconvenience it must occasion, when performed in the town of Boston, where every blaze, out at the top of a chimney, excites an alarm, and subjects the proprietor of it to an expensive penalty, I applied to Mr. Heath, an intelligent artist, an inhabitant of the town, to vary the construction of the Pot Ash Furnace so as to obviate this difficulty. He has effected the purpose completely. Instead of carrying out the chimney from the farthest end of the fire place, he there left a sufficient vacancy beyond the kettles,

kettles, for the fire to pass up to the flues, which he opened, one on each side the kettles, to return the flame round them toward the mouth of the Furnace, and conduct it into the chimney raised directly over the door.

This improvement lessens the consumption of fuel, for by it, the same fire is brought to act a second time on the kettles, is nearly expended round them, and not wasted in the chimney.



P O S T S C R I P T.

IT would be injustice to the remarks on the subject of Pot and Pearl Ashes, not to notice an advertisement which appeared in the Gazette of the United States, published July last, at Philadelphia, and signed Samuel Hopkins.

It is there asserted as an advantage arising from Mr. Hopkins's method of manufacturing Pearl Ash, that "by calcining the ashes before the leys are drawn from them, we obtain as great a quantity, at least of Pearl Ashes, as of common black salts;" and Mr. Hopkins adds, "Pearl Ashes generally sells, when at market £50 per ton. The highest price for black salts is £25 per ton, and if converted into Pearl Ashes, it requires as much more labour and fuel as in the first instance, and a loss from twenty-five to thirty per cent." Could this be realized, lucrative indeed would be the business. But if it should turn out that spurious ashes are the product of his supposed improvement; that they are the alkaline salt confounded with a variety of neutral salts, and a greater portion of earth than are found in Pearl Ash manufactured after the usual mode; although so bleached by the action of the fire and air, as to give it the appearance of good "Pearl Ashes of a very fine white colour;" yet when accurately analyzed, even the 25 or 30 per cent. supposed to be saved in the weight of the Pearl Ash, may discover itself to be still the earthy and saline impurity, although deprived of colouring matter by calcination.

If this is the result of Mr. Hopkins's method, it will not be deemed presumptuous to call in question his mode of manufacturing, although sanctioned by a patent, and recommended by the opinion of some of the most celebrated characters in the United States—characters justly celebrat-

ed for their distinguished eminence in science.* In this instance, however, they appear complaisantly to have subscribed to *Mr. Hopkins's definition*, where he says, "Black salts are made by boiling down the leys from common wood ashes, until they are perfectly dry;" and "Pot Ashes are made by melting the black salts in a very strong fire, and lading it out into coolers;" without the least intimation that from the alkaline salt all others are to be separated, to make the *best* of ashes:—For, in the alkali alone is the excellence of Pot or Pearl Ash. Indeed some have vainly imagined that by Mr. Hopkins's method of manufacturing, an actual *transmutation* of 25 or 30 per cent. is effected, and that the saline impurities are converted into genuine alkaline salt.

The gentlemen referred to, who gave Mr. Hopkins their certificate, could not entertain such an opinion; for, although *tartar* is alkalinized by fire, and *nitre* by the peculiar inflammability of its acid, when burned, leaves its alkaline basis uncombined, yet the strongest fire of a glass house has never effected the separation of the vitriolic acid from its alkaline basis in vitriolated tartar, or the marine acid from the mineral alkali in sea salt. By force of fire they may both be melted, and perhaps evaporated; but when dissolved, or condensed, they are found the same, and may again be chrysalized. No chemical fact is better known, or more thoroughly established, than that the union of acids and alkalies in neutral salts, is too strong to be in the least effected by any sort of earth yet known; therefore it is not to be expected that either the acid of neutral salts will be dissipated, or any new combination will take place in consequence of calcining them with the earth of wood ashes.

Mr. Hopkins also says, that "Pot Ashes made from calcined ashes are allowed to be much superior to those made in the common mode."

However fair the Pot Ash may be made to appear by the previous calcination, unless the neutral salts have been separated, it cannot be equally as good as that which is properly made, because it does not contain the same proportion of alkaline salt.

There cannot be a more decisive test to evidence this, than to take a specimen of each, and with the same ingredients, under similar management, to ascertain the quantity of soap they severally produce.

* *David Rittenbouse, Benjamin Rush, James Hutcheson, Benjamin Say, Casper Wistar, jun. and John Pennington.*

F I N I S.